

The Effect Of Arrowroot Starch (*Marantha Arundiceae L*) Into Alginate Towards Alginate Impression Setting Time

Pengaruh Penambahan Pati Garut (*Marantha Arundiceae L*) Ke Dalam Alginat Terhadap Setting Time Hasil Cetakan Alginat

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Abstract

Background : The demand of alginate increase overtime, in otherhand, Indonesia could not produce its own alginate yet. Limited access to get alginate in certain region of Indonesia raise an idea to appllicate arrowroot starch into alginate to reduce alginate using. One of impression material requirment is has suitable setting time. The effect of adding arrowroot starch into alginate towards its dimensional stabillity has been published, but the effect toward its setting time has not been evaluated. **Methods :** This study using 60 sample that divided into 4 groups (control, 45%, 50%, and 55% of added arrowroot starch). Acrilic stick is used by entering it into alginate after 10 second, and replied until no alginate on acrilic stick. The time when no alginate on acrilic stick was record by stopwatch. **Result :** Statistically, Kruskall-Wallis test is show that arrowroot starch which add into alginate have significant effect towards alginate impression setting time with $p=0,000$. **Conclusion :** Arrowroot starch which has been added into alginate has an effect towards alginate impression setting time.

Key words : alginate, arrowroot starch, alginate, impression setting time.

Abstract

Latar belakang : permintaan alginat terus bertambah dari tahun ke tahun, di sisi lain, Indonesia belum dapat memproduksi alginat sendiri. Keterbatasan akses pada daerah tertentu di Indonesia memunculkan ide untuk mencampurkan alginate dengan pati garut yang memiliki kesamaan karakteristik dengan alginat, untuk mengurangi jumlah penggunaan alginat. Salah satu syarat abhan cetak adalah memiliki waktu setting yang wajar. Publikasi tentang pengaruh penambahan pati garut terhadap stabilitas dimensi telah dipublikasikan, akan tetapi penelitian tentang pengaruhnya terhadap setting belum dievaluasi. **Metode :** Penelitian ini menggunakan 60 sampel yang dibagi menjadi 4 kelompok (kontrol, penambahan pati garut sebesar 45%, 50%, dan 55%. Batang akrilik dicelupkan ke dalam adonan alginat setiap 10 detik, dan diulang hingga tidak ada lagi alginat yang menempel pada batang akrilik. Waktu ketika tidak ada lagi adonan alginat yang menempel pada batang akrilik, emnandakan bahwa sampel telah mengalami setting time, dan diukur dengan stopwatch, **Hasil :** Hasil uji Kruskall-Wallis menunjukkan bahwa penambahan pati garut ke dalam alginate berpengaruh secara signifikan terhadap waktu setting hasil cetakan alginate dengan nilai $p=0,000$. **Kesimpulan :** Pati garut yang ditambahkan ke dalam alginat berpengaruh terhadap waktu setting hasil cetakan alginat.

Kata kunci : alginat, pati garut, waktu setting hasil cetakan alginate.

Introduction

Alginate is most usual impression material that have been used in Indonesia. The dentist not always work in area where get the easy accessibility for alginate supply.

This problem created an idea to mix alginate with some hydrophilic materials that easily found in Indonesia, especially for remote area¹.

Arrowroot starch (*Maranta arundinaceae* L.) contain for amylose and amylopectin 23.5%. Those contain be a reason gummy characteristic for starch cuisine². Amylose and amylopectin are kind of carbohydrate. Alginate also contain of carbohydrate. This why alginate might be mixed with arrowroot starch because they had similar characteristic in gelation process forming hydrogel when it was reacted with water³.

Setting time is important thing that used as a parameter for impression material already impress oral anatomy or not. Before alginate reach its setting, the material will flow to shape oral anatomy, then setting process will occur, flowable form of alginate will be solid form and impressing oral anatomy finely⁴.

The effect of adding arrowroot starch into alginate towards its dimension stability has been known⁵, but publication of its effect towards setting time is not published yet. Based on that references, author will continue the study by publishing the effect of arrowroot starch into alginate towards its setting time, and to identify the level of significance these effect, and which group that give the biggest effect towards alginate setting time.

Materials and Methods

Materials

Plastic ring with 3.2 cm in diameter and 2.2 cm in high that put on glass plate 12,1 X 10.1 X 0.8 cm has been used for this study.

In this study, sample group divided into four groups, they are:

Group A, is control group, using pure alginate 100% (without arrowroot starch addition), 7.5 grams for each sample. Number of sample : 5 samples.

Group B, is experiment group, ratio arrowroot starch : alginate is 45 : 55% (3.375 : 4.125 grams). Number of sample : 5 samples

Group C, is experiment group, ratio arrowroot starch : alginate is 50 : 50% (3.75 : 3.75 grams). Number of sample : 5 samples

Group D, is experiment group, ratio arrowroot starch : alginate is 55 : 45% (4.125 : 3.375 grams). Number of sample : 5 samples

Methods

Control group and mixed arrowroot starch-alginate as impression material manipulated by 17.5 ml steril aquadest in rubber bowl for 30 seconds⁶. Turn on the stopwatch. Each manipulated sample put in plastic ring on glass plate, then the surface of manipulated sample flattened by spatula. Hold the outer side of plastic ring. Enter acrylic stick into manipulated sample even 10 seconds, and pull out soon as soon possible. Clean up the stick with tissue and enter it again soon. Repeat this procedure until no manipulated sample glue on acrylic stick⁷. After no manipulated sample glue on acrylic stick, it means the sample reach their setting⁶. Turn off the stopwatch, and write the result based on stopwatch.

Results

Table 1. Setting time of all samples

Group	Sample	Setting time (second)
A	1	54
	2	55
	3	50
	4	53
	5	52
B	1	60
	2	61
	3	81
	4	83
	5	85
C	1	117
	2	112
	3	113
	4	113
	5	112
D	1	120
	2	134
	3	133
	4	132
	5	122

Table 2. Mean of setting time of all group

Kelompok	Mean of setting time
Kontrol	52,80
Pati 45%	74,00
Pati 50%	113,40
Pati 55%	128,20

Discussion

Based on Kruskal-Wallis test, arrowroot starch adding into alginate has significant effect towards its setting time. Mean of setting time each group known up and up for each increasing arrowroot starch ratio, it suitable with biomaterial expert statement which said that higher viscosity of alginate will prolonge its seting time⁴. Alginate setting time will longer when more water added into it⁸.

Based on Post hoc-LSD analysis, is known that all of experiment group show the longer tsetting time than control group. For 45,50, and 55% arrowroot starch addition into alginate could prolonge regular set alginate setting time reach up 1.4 to 2.4 times.

It proofed that adding hydrophilic component into another material which has similiar hydrophilic characteristic give the significant effect towards alginate setting time.

Alginate has filler component as one of its former. These filler will make setting alginate mass be more solid. Less filer in alginate, will make the impression lack its consistency, because filler which has a role to make its solid is inadequate to streghthen impression mass³.

Pure alginate that have been used as control group have more filler and another component than experiment group, it will make control sample were more rigid than one. Beside that, arrowroot starch which contain of 23% amylose and amylopectin², will add the hydrophilic characteristic of impression material, so it will easily absorb the water from its envirointment. It will inhibit crosslink

process of hydrogel forming of impression material. This why impression material with arrowroot starch addition has the longer setting time.

Conclusions

Adding 45%, 50%, and 55% arrowroot starch into alginate has a significant effect to prolonge its setting time reach up 1.4 to 2.4 times.

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